The INL-developed Transmission Line Security Monitor can remotely detect abnormal vibrations and faults on high-voltage transmission lines.

Transmission Line Security monitor

High-voltage transmission lines strung from support towers sprawl for thousands of miles across the United States and form the backbone of the nation's electric power grid. The grid carries power from generating sources to industrial complexes, urban areas and rural communities across America.

On its march from power generators to consumers, much of the high-voltage transmission corridor passes through remote areas where security is scant or not available. Authorities recognize that our power grid is vulnerable to terrorist attacks, vandalism and extreme natural conditions including weather, fire and seismic activity. These conditions can bring lines and towers down and disrupt service to wide areas of the country. Until recently, there was no cost-effective way to comprehensively monitor the grid, optimize performance and protect it from catastrophic failures.

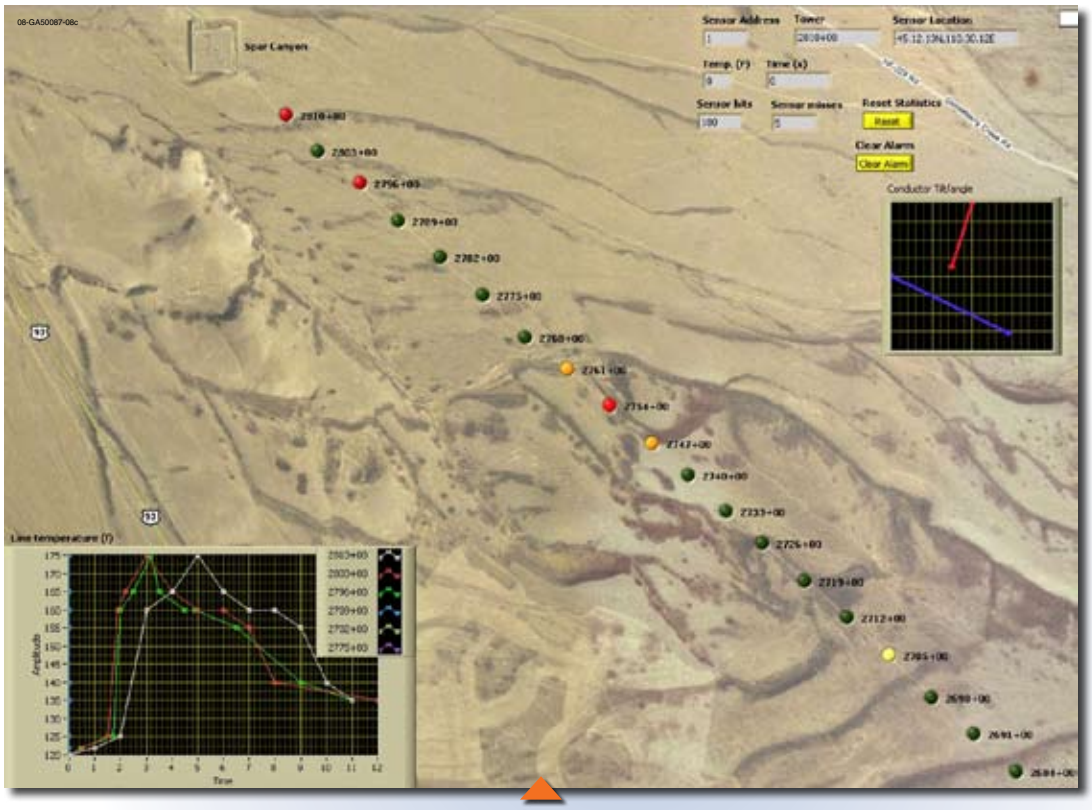
Engineers at Idaho National Laboratory are working on an advanced transmission monitoring system that is providing an effective and inexpensive way to monitor the physical security of towers and transmission lines. The Transmission Line Security monitor senses and identifies threats, then alerts power system operators to protect these valuable assets and take action to prevent damage.

The TLS monitors are mounted directly on high-voltage lines ranging from 230 kV to 500 kV near each support tower. Using wireless communications to monitor and relay real-time threat information from tower to tower, these advanced sensors can detect tampering from sources such

Continued next page

The Energy of Innovation

Idaho National Laboratory



The Transmission Line Security Monitor uses wireless communication to relay the status of high-voltage transmission lines to command and control centers.

Continued from previous page

as unbolting tower support structures, the use of cutting torches and saws, shooting of conductors and insulators, and explosive blast events. The sensors also monitor for operational problems such as excessive sagging of the conductor and galloping conductors.

The TLS monitor is housed in a small, weatherproof and corona-resistant enclosure that clamps on to the transmission line conductor. Placement on energized high-voltage lines can be accomplished by using a specially designed tool. The TLS monitor requires no batteries – it derives power from the magnetic field generated by the flow of current through the conductor. If there is a loss of transmission line power, the TLS monitor will continue to operate for several minutes to provide post-interruption information.

The principal innovations that make the TLS monitor possible are the development of custom software signal processing algorithms and secure packaging to integrate an array of advanced sensors and communications technologies. On-board processing and analysis identify sensor inputs as threats that require immediate attention, or as natural non-threats that receive a lower response priority.

These advances give the TLS monitor the ability to detect and characterize transmission tower vibrations, detect infrared heat at the base of the tower, analyze conductor conditions, and pinpoint the location and nature of potential problems. This type of on-scene, real-time information has the potential to thwart costly and disruptive terrorist, vandalism or weather events, and help utilities maximize power transmission efficiency and performance.

The TLS monitor was conceptualized and developed in 2005, and licensed to California-based Lindsey Engineering the following year. Current enhancements to the technology are receiving funding from the Department of Defense's Technical Support Working Group. Additional power line testing is scheduled to occur this year.

For more information

Technical Contacts

John Svoboda
(208) 526-0857
john.svoboda@inl.gov

Robert Polk
(208) 526-0850
robert.polk@inl.gov

Licensee Contact

Phil Spillane
Lindsey Manufacturing Co.
(626) 969-3471, Ext 148
pspillane@lindsey-usa.com

Technology Transfer Contact

Lisa Nate
(208) 526-2426
lisa.nate@inl.gov

A U.S. Department of Energy National Laboratory